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Application Number	10/695,978
Filing Date	10-29-2003
First Named Inventor	Edmund O. Schweitzer III
Art Unit	2836
Examiner Name	Lucy M. Thomas
Total Number of Pages in This Submission	
Attorney Docket Number	1444-0093

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
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- [ ] Appeal Communication to Board of Appeals and Interferences
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Cook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd.		
Signature	David M. Mundt		
Printed name	David M. Mundt		
Date	August 23, 2007	Reg. No.	41,207

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Typed or printed name	Francisca M.A. Hubbard	Date	August 23, 2007

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FEE TRANSMITTAL For FY 2007

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($)500.00

Complete If Known	
Application Number	10/695,978
Filing Date	10-29-2003
First Named Inventor	Edmund O. Schweitzer III
Examiner Name	Lucy M. Thomas
Art Unit	2836
Attorney Docket No.	1444-0093

METHOD OF PAYMENT (check all that apply)

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☐ Deposit Account Deposit Account Number: ______ Deposit Account Name: ______

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims ______ - 20 or HP = **Extra Claims** ______ x **Fee ($)** ______ = **Fees Paid ($)** ______

HP = highest number of total claims paid for, if greater than 20

Multiple Dependent Claims **Fee ($)** ______ **Fee Paid ($)** ______

Indep. Claims ______ - 3 or HP = **Extra Claims** ______ x **Fee ($)** ______ = **Fees Paid ($)** ______

HP = highest number of independent claims paid for, if greater than 3

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets ______ - 100 = **Extra Sheets** ______ /50= **Number of each additional 50 or fraction thereof** ______ (round up to a whole number) x **Fee ($)** ______ = **Fee Paid ($)** ______

4. OTHER FEE(S)

	Fee Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Filing of Appellant's Brief	$500.00

SUBMITTED BY

Signature	[signature]	Registration No. 41,207 (Attorney/Agent)	Telephone 312-984-0144
Name (Print/Type)	David M. Mundt		Date August 23, 2007

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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AUG 2 3 2007
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Patent
Atty. Docket No. 1444-0093

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	)	Examiner: Lucy M. Thomas
	)	
Edmund O. Schweitzer, III	)	
	)	Group Art Unit: 2836
Serial No. 10/695,978	)	
	)	
Filed: 29 October 2003	)	
	)	
For: PROTECTIVE RELAY FOR POWER SYSTEMS HAVING FAULT DISTANCE MEASUREMENT FILTER LOGIC	)	

APPELLANT'S BRIEF

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AUG 2 3 2007
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TABLE OF CONTENTS

This is an appeal from the fourth Official Office Action, mailed 7 May 2007. The Notice of Appeal was filed on 26 July 2007.

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REAL PARTY IN INTEREST

The Real Party in Interest in the present application is Schweitzer Engineering Laboratories, Inc., who is assignee of the present application and which assignment has been recorded in the Assignment Branch at Reel 014976, Frame 0417.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-3, 5-7, and 14-17 are currently present in this application. Claims 1 and 14 are independent.

No claims have been allowed.

All claims 1-3, 5-8, 10, 11, and 14-17 have been finally rejected in the fourth Official Office Action, and Appellant hereby appeals from such rejection of all those last mentioned claims. A copy of the rejected claims in numerical order and from which this appeal has been taken appears in the Appendix to this brief.

STATUS OF AMENDMENTS

One amendment has been filed on 2 June 2007and entered subsequent to the last Official Office Action mailed 7 May 2007 finally rejecting all claims in this application and from which this appeal has been taken. The amendment cancelled claims 8, 10, and 11, and did not amend any other claims. The Examiner issued an Advisory Action stating that the amendment was entered on 17 July 2007. As of the Amendment and Advisory Action, claims 1-3, 5-7, and 14-17 are currently pending in the present application.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed to a system for improving the performance of a distance-type protective relay for power systems. Modern protective relays include a method of

determining a distance to a fault on a power line based on measured voltages and currents. Distance relays also typically will only trip the power line if a fault is within a particular zone of protection. Often when the fault is near the end of the zone, the m-value (analogous to the distance from the relay to the fault) contains noise that make it difficult to determine whether the fault is within the zone. This invention increases performance by applying a filter to smooth the m-value in certain situations.

Specifically, the relay includes a calculation circuit that produces a quantity (m) that is analogous to the distance between the relay and a fault on the power line using voltage and current values from the power line. A quantity (m') is applied to a distance element (Fig. 1, item 20) for comparison to a setting reach value for a selected zone of protection (Page 1, lines 14-29). The quantity (m') is either a filtered m-value (m_s) or an unfiltered m-value depending on the unfiltered m-value and preselected thresholds. This allows the system to generate a trip signal only if the calculated distance to the fault is within the zone of protection.

The system comprises a filter circuit (Fig. 1, item 18) responsive to the quantity (m) for filtering before the quantity (m') is applied to the distance element (20). The filter circuit (18) results in noise attenuation of the quantity (m) (Page 4, lines 17-22, Page 4 line 36-Page 5 line 2, Page 6 lines 6-18). The system also comprises a control circuit (Fig. 1, item 21) for controlling the application of the quantity (m') to the distance element (20) such that the filtered quantity (m_s) is applied only when the quantity (m) is above a preselected threshold value and below another preselected threshold value (Page 5 line 3-Page 6 line 5, Page 7, lines 20-24).

Accordingly, when the fault is not near the end of the protection zone, the relay does not apply the filter, resulting in faster tripping. Alternatively, when the fault is near the end of the protection zone, the relay does apply the filter which results in a slower, but more accurate trip as it is more likely that the fault is within the protection zone. See Page 5, lines 17-35.

Also claimed[1] is a method for selecting between applying a filtered m-value (m_s) and an unfiltered m-value (m) to a distance element of a protective relay (Page 5, lines 10-16). The "m" values are analogous to a distance between the relay and a fault on the power line protected by

[1] Claim 14 includes a step included on the originally-filed claim (in the Amendment of 28 December 2005), but henceforth left out of the claim. The step reciting "comparing the first distance value to a second percentage of the zone reach value to form a second binary output, the second percentage of the zone reach value less than the zone reach value" was not included (in strikethrough or otherwise) in any subsequent amendment, though no notice of noncompliant amendment was issued to Applicant. Applicant believes that this element should still be part of claim 14.

the relay. The relay includes a calculation circuit to generate the unfiltered m-value and a filter adapted to filter the m-value to form a filtered m-value (m_s) (Page 4, lines 17-22, Page 4 line 36-Page 5 line 2, Page 6 lines 6-18). The method includes a step of comparing the unfiltered m-value to a threshold (Page 5 line 3-Page 6 line 5). The first threshold is a percentage of a zone reach value that is greater than the zone reach value (Page 7, lines 20-24). The method also includes a step of comparing the unfiltered m-value to a second threshold (Page 5 line 3-Page 6 line 5). The second threshold is another percentage of the zone reach value where this percentage is less than the zone reach value (Page 5 lines 25-35).

Another step includes providing the unfiltered m-value to the distance element depending on the outputs of the steps of comparing the unfiltered m-value to the thresholds (Page 5 lines 10-16). The filtered m-value (m_s) is provided to the distance element depending on the outputs of the steps of comparing the unfiltered m-value to the thresholds (Page 5, lines 10-16).

GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL

The issue in this appeal is whether the claims on appeal, claims 1-3, 5-7, and 14-17, are allowable over the rejection stated in the last Official Office Action, namely whether claims 1-2 and 6 are anticipated under 35 U.S.C. §102(b) by the Guzman-Casillas reference (US Patent 6,028,754) and whether claims 3, 5, 7, and 14-17 are obvious under 35 U.S.C. §103(a) over the Guzman-Casillas reference.

ARGUMENT

1. The Rejection of Claims 1-2 and 6 Under 35 U.S.C. §102(b) Is Clear Error and Must be Reversed

As discussed in the Summary above, the present invention is directed to a system for improving the performance of a distance-type protective relay for power systems by applying a filter to a quantity analogous to the distance between the relay and the fault (m) before applying the filtered quantity (m_s) to the distance element when the quantity (m) is within preselected thresholds. The Guzman-Casillas reference discloses generating a quantity analogous to the distance between the relay and the fault (m), and applying this quantity (m) to a distance element. The Guzman-Cassillas reference also discloses applying an alternative to generating a

trip signal when the quantity (m) is within thresholds. However, the Guzman-Casillas reference does not teach application of a filtered quantity (m_s) to a distance element.

It is important to note that the claimed distance element is a conventional distance element, that is, it compares a quantity analogous to the distance between the relay and the fault (m') with a set reach value. In other words, the distance element compares the m-value with the setting reach value to determine whether the fault is within a zone of protection of the relay. The function of the distance element is described in the specification as "when the m' value is greater than the set reach value, the relay does not produce a trip signal to its associated breaker, while when the m' value is less than the set reach value, the distance element will produce a trip signal which operates the circuit breaker." Page 4 lines 29-35. As can be seen in Figure 1, m' is either the filtered m-value (m_s) or the unfiltered m-value. Further, as described in claim 1, the m-value is applied to a "distance element *for comparison of said quantity with a setting reach value for a selected zone of protection*". Claim 1, emphasis added. Thus, the distance element claimed must be for comparing the quantity (m') with a setting reach value.

The Guzman-Casillas reference does not disclose that the quantity (m) is provided to a filter (resulting in noise attenuation of the quantity (m_s)), or a control circuit for controlling the application of the filtered quantity (m_s) to the distance element, as claimed in claim 1 (upon which claims 2 and 6 depend).

The Guzman-Casillas reference includes a zone 1 reach that is divided into sections (it is important to note that in the present application as claimed it is effectively divided by *preselected* thresholds, and in the Guzman-Casillas reference it is divided by calculating the value of the system impedance ratio, *i.e. not using preselected thresholds*, see column 9 lines 53-60). The Guzman-Casillas reference then applies the quantity (m) to the distance element to determine whether the quantity (m) is within the "instantaneous portion" (wherein there is no delay to issuing a trip signal) or whether the quantity (m) is within the "time-delayed" portion (wherein there is a time-delay and a smoothness determination made before issuing a trip signal). Guzman-Casillas Column 9 line 53-Column 10 line 2.

As mentioned above, the Guzman-Casillas reference never applies a filtered m-value (m_s) to a distance element, so it cannot disclose a control circuit for controlling the application of the filtered m-value (m_s) to the distance element, as claimed in claim 1 of the present application.

The system and method disclosed in the Guzman-Casillas reference can be explained using the figures therein. Figure 6 is a diagram of the transient detection circuit. The Examiner basis her argument on the fact that one of the inputs into comparator 72 is a filter. Nonetheless, the output of that comparator (presumably a "filtered" output) is never applied to a distance element, nor can it be applied to a distance element following Figure 6 of the Guzman-Casillas reference or its accompanying description. The distance element is shown as comparator 76 to which the inputs are the m-value (such as the m-value for a fault between phases a and b as shown) and the Zone 1 value. This comparator (along with similar comparators for the other phases) is the only item in this figure that could be a distance element within the meaning of claim 1. If the m-value is within the Zone 1 (smaller than the Zone 1 value) then a high value is produced (mAB1) and applied to AND gate 74 along with the "filtered" output from comparator 72. In parallel, these comparators work to determine 1) whether the m-value has settled acceptably and 2) whether the m-value (mab in this case, which is *not* a filtered m-value) is within a zone of protection. This does not disclose that a filtered m-value (presumably an output from comparator 72) is ever, or can be ever, applied to a distance element (such as comparator 76) because these comparators work in parallel, and no output of one is an input to another.

Further, the method described in the Guzman-Casillas reference is illustrated in Figure 9. As can be clearly seen in Figure 9, the Zone 1 is divided into "instantaneous" and "time-delayed" portions using (instead of preselected thresholds) a calculated SIR in step 120. The m-value is then calculated in step 126. The m-value (unfiltered) is applied to a decision block 130 of whether it is within the new ("instantaneous") zone in step 130. This can be a distance element within the meaning of claim 1. If the m-value is within the "instantaneous" zone, then a trip command is generated in step 132. Otherwise, the m-value (unfiltered) is applied to a second distance element in decision block 134 where it is determined whether the m-value (unfiltered) is within Zone 1. If not, the method ends. If it is, a time delay is started in 136, and while the time delay is running, a smoothness determination is made in 140. Even if this smoothness determination and/or time delay are interpreted to be a "filter" and its output is interpreted to be a "filtered m-value" within the meaning of claim 1 (to which Applicant does not concede), that output is never applied to a distance element. There are no lines leading from this step 140 to either of the decision blocks 130 or 134. If the smoothness criteria are met or the timer runs out, then a trip command is generated. Otherwise the process ends.

Step 132 of the Guzman-Casillas reference (Figure 9) is not a distance element, but is instead a step showing that "the circuit breaker for the system is tripped". See Guzman-Casillas Column 11, lines 7-8. Guzman-Casillas does not disclose that step 132 is a distance element.

Further, even if step 132 were interpreted as being a "distance element" it would not be a "distance element" within the limitations of claim 1 because it is not "for comparison of said quantity [m'] with a setting reach value for a selected zone of protection" as required by claim 1. The inputs to step 132 are *binary* ("yes" or "no") results of decisions 130, 138, and 140. These binaries are not a "quantity analogous to the distance between the relay and a fault on the power line". To disclose the claimed distance element, step 132 would need one input of a setting reach value (which the Guzman-Casillas reference has not disclosed) and another input as a "quantity analogous to the distance between the relay and a fault on the power line" (which the Guzman Casillas reference has not disclosed).

Instead, the Guzman-Casillas reference teaches that the "quantity analogous to the distance between the relay and a fault on the power line" is applied to decision blocks 130 and/or 134 (distance elements). If the quantity is determined to be within an "instantaneous" zone, then a trip command (step 132) is issued. If the quantity is determined to be within the setting reach but outside of the "instantaneous" zone, then a time delay (step 136) is started and a smoothness determination (step 140) is made. Once the smoothness requirement is met or the time delay is elapsed and the quantity is still within the setting reach, then a trip command (step 132) is issued without applying or deciding to apply a filtered m-value to any distance element.

Applicant puts forth that the Guzman-Casillas reference does not disclose a filter as claimed in claim 1 in that neither the smoothness determination of step 140 nor the comparator 72 are filters resulting in noise attenuation of the quantity (as claimed in claim 1) because their output is not a noise attenuated m-value, but is instead a binary (1 or 0) value indicative of whether the m-value has smoothed. Further, the time delay is also not a filter resulting in noise attenuation of the m-value (as claimed in claim 1) because the output is not a noise attenuated m-value, bit instead a binary (1 or 0) value indicative of whether the time has elapsed in step 138.

Applicant further puts forth that the Guzman-Casillas reference does not disclose a control circuit wherein the filtered quantity is applied only when the quantity is above a preselected first threshold value and below a preselected second threshold value. The "threshold values" of the Guzman-Casillas reference are calculated by the system (as opposed to being

preselected) based on the source-to-line impedance ratio (SIR, also referred to as system impedance ratio). The SIR is calculated by the system based on the Zone 1 reach impedance and the source impedance. Column 9 lines 53-60, and Column 10, lines 30-35.

Accordingly, several elements and limitations are not taught by the Guzman-Casillas reference. Claim 1 cannot be anticipated by the Guzman-Casillas reference.

2. The Rejection of Claims 3, 5, 7, and 14-17 Under 35 U.S.C. §103(a) Is Clear Error and Must be Reversed

As to claims 3, 5, and 7, these are all dependent on claim 1. As described above, there are several limitations of claim 1 that are neither taught nor disclosed by the cited art references. The Guzman-Casillas reference is the only reference cited against these claims. Because there are limitations in independent claim 1 and all claims that depend thereon (including claims 3, 5, and 7), these claims are not obvious in light of the cited art references.

As to claims 14-17, claim 14 is independent, and claims 16-17 depend thereon. As described above, claim 14 is drawn toward a method for selecting between application of an unfiltered m-value and a filtered m-value (m_s) provided to a distance element of a protective relay. One step in the method requires providing a filtered m-value (m_s) to the distance element when certain conditions are met.

As described above, the Guzman-Casillas reference teaches applying an m-value to a distance element, but does not teach or suggest applying a filtered m-value to a distance element. The items and steps that are possible distance elements as described in the Guzman-Casillas reference include comparator 76 of Figure 6 and steps 130 and 134 of Figure 9. As described above, the Guzman-Casillas reference nowhere teaches or suggests that an input to any of these distance elements is a filtered m-value.

Because there is at least one step that is neither taught nor suggested by the single reference cited against claim 14, this claim and all claims that depend thereon are not obvious in light of the reference cited.

CONCLUSIONS

Thus, even when the cited reference that has been relied upon in the rejection of the claims is fully considered, several of the important features of the claimed system and method of the present invention are still missing. These include:

A. A system for improving the performance of a distance-type relay comprising: a control circuit for controlling the *application of the filtered quantity to the distance element.*

B. The system as described in A, further comprising a filter circuit responsive to said quantity before the quantity is applied to the distance element, resulting in noise attenuation of the quantity.

C. The system as described in A, wherein the filtered quantity is applied to the distance element only when said quantity is above a *preselected* first threshold and below a *preselected* second threshold value.

D. A method for selecting between one of an unfiltered m-value and a filtered m-value provided to a distance element of a protective relay providing protection for a transmission line of a power system, the method comprising the step of *providing the filtered m-value to the distance element.*

For the above reasons, it is respectfully submitted that the rejection of all of the claims here on appeal, claims 1-3, 5-7, and 14-17, must be reversed.

Respectfully submitted,

Date: 23 August 2007

By: [signature]

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CLAIMS APPENDIX

1. (Rejected) A system for improving the performance of a distance-type protective relay for power systems, wherein the relay includes a calculation circuit responsive to voltage and current values from the power line to produce a quantity analogous to the distance between the relay and a fault on the power line, wherein the quantity is applied to a distance element for comparison of said quantity with a setting reach value for a selected zone of protection, the system comprising:

a filter circuit responsive to said quantity for filtering said quantity before the quantity is applied to the distance element, resulting in noise attenuation of the quantity; and

a control circuit for controlling the application of the filtered quantity to the distance element such that the filtered quantity is applied only when said quantity is above a preselected first threshold value and below a preselected second threshold value.

2. (Rejected) The system of claim 1, wherein the preselected first threshold value is a selected percentage of the setting reach value.

3. (Rejected) The system of claim 2, wherein the selected percentage is 100% minus an error of the system plus 5% for the relay.

4. (Canceled)

5. (Rejected) The system of claim 2, wherein the selected percentage is approximately 92%.

6. (Rejected) The system of claim 1, further comprising a circuit for pre-charging the filter to the preselected second threshold value when said quantity decreases to the preselected second threshold value from said high value, in response to a fault.

7. (Rejected) The system of claim 1, wherein the preselected second threshold value is approximately four times the setting reach value.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Canceled)

12. (Canceled)

13. (Canceled)

14. (Rejected) A method for selecting between one of an unfiltered m value and a filtered m value provided to a distance element of a protective relay providing protection for a transmission line of a power system, the protective relay including a calculation circuit adapted to provide the unfiltered m value indicative of a distance between the protective relay and a fault,

and a filter adapted to filter the unfiltered m value to form the filtered m value, the method comprising:

comparing the unfiltered m value to a first percentage of a zone reach value to form a first binary output, the first percentage of the zone reach value greater than the zone reach value;

comparing the first distance value to a second percentage of the zone reach value to form a second binary output, the second percentage of the zone reach value less than the zone reach value

providing the unfiltered m value to the distance element when the first binary output comprises a low binary value or when the second binary output comprises a high binary value; and

providing the filtered m value to the distance element when the first binary output comprises a high binary value and the second binary output comprises a low binary value.

15. (Rejected) The method of claim 14, wherein the first binary output has a binary high value when the first percentage of the zone reach value is greater than the unfiltered m value, and has a binary low value when the first percentage of the zone reach value is less than the unfiltered m value, and wherein the second binary output has a binary high value when the second percentage of the zone reach value is greater than the unfiltered m value, and has a binary low value when the second percentage of the zone reach value is less than the unfiltered m value.

16. (Rejected) The method of claim 14, wherein the filter is charged immediately after the unfiltered m value is equal to or less than the first percentage of the zone reach value, the unfiltered m value equaling the first percentage of the preselected setting indicating an occurrence of a fault in the transmission line.

17. (Rejected) The method of claim 14, wherein the filter operation is defined by ms_{k-1}.

18. (Canceled)

19. (Canceled)